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APPLN. FILING DATE: JULY 16, 2003

TITLE: HEATING ELEMENT CONDITION MONITOR

INVENTORS: KEVIN B. PECK ET AL.

APPLICATION SERIAL No: 10/619,561

SHEET 1 of 19

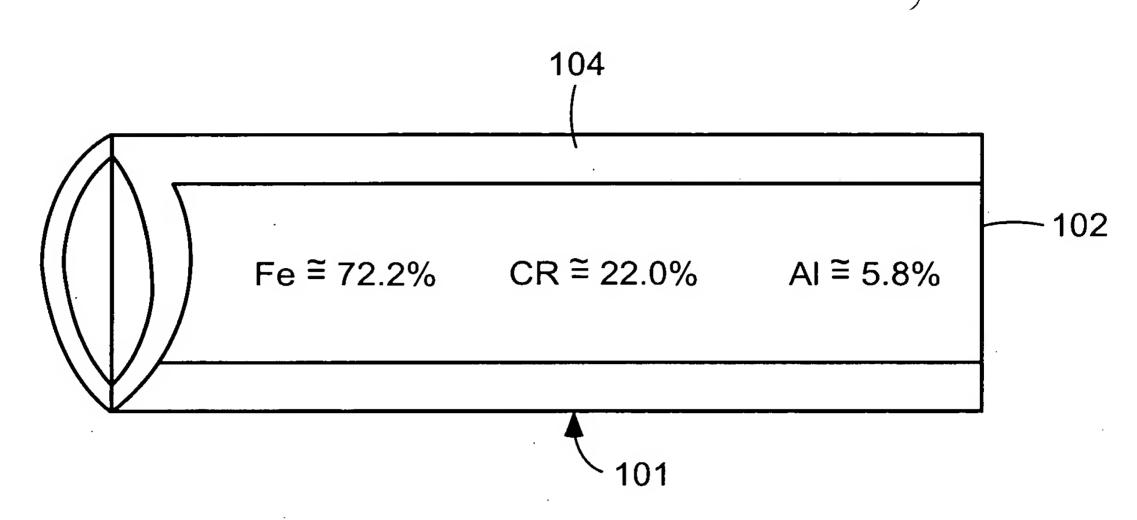


FIG. 1

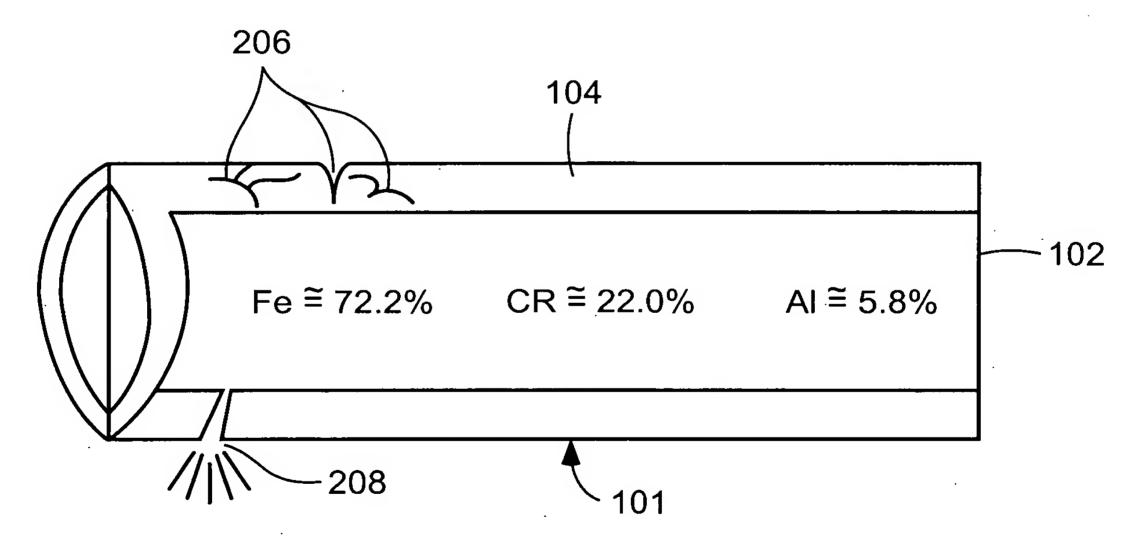


FIG. 2

TITLE: HEATING ELEMENT CONDITION MONITOR

INVENTORS: KEVIN B. PECK ET AL. APPLICATION SERIAL NO: 10/619,561

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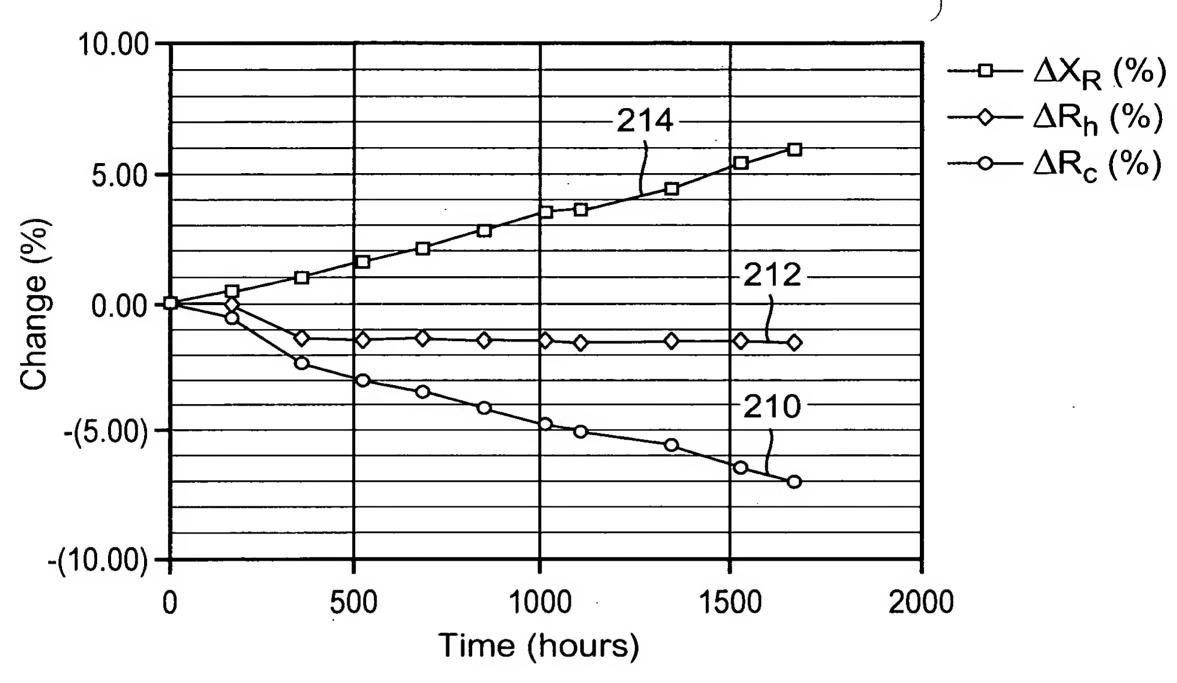


FIG. 2A

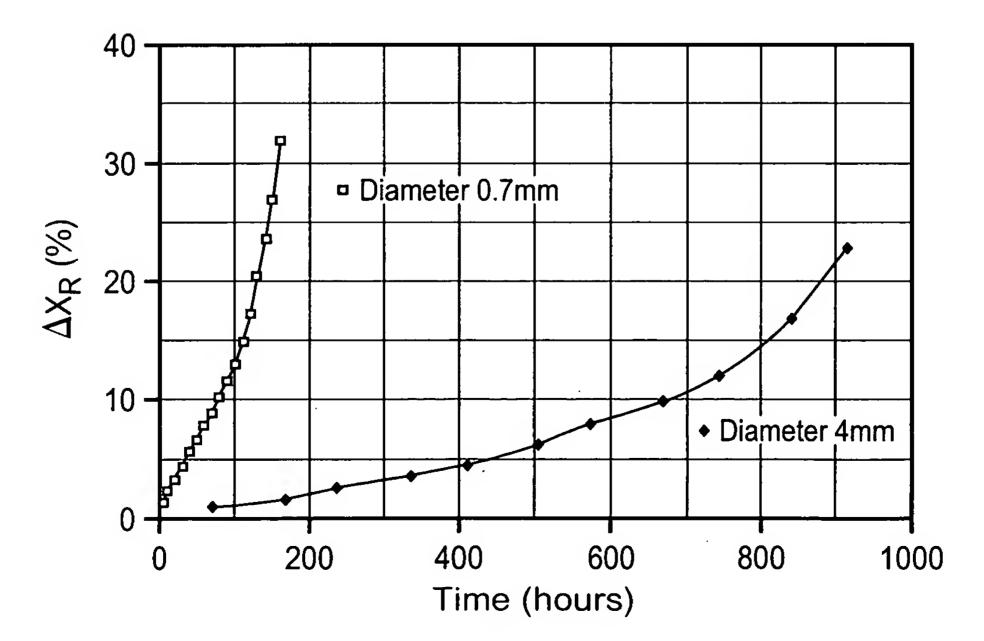


FIG. 2B

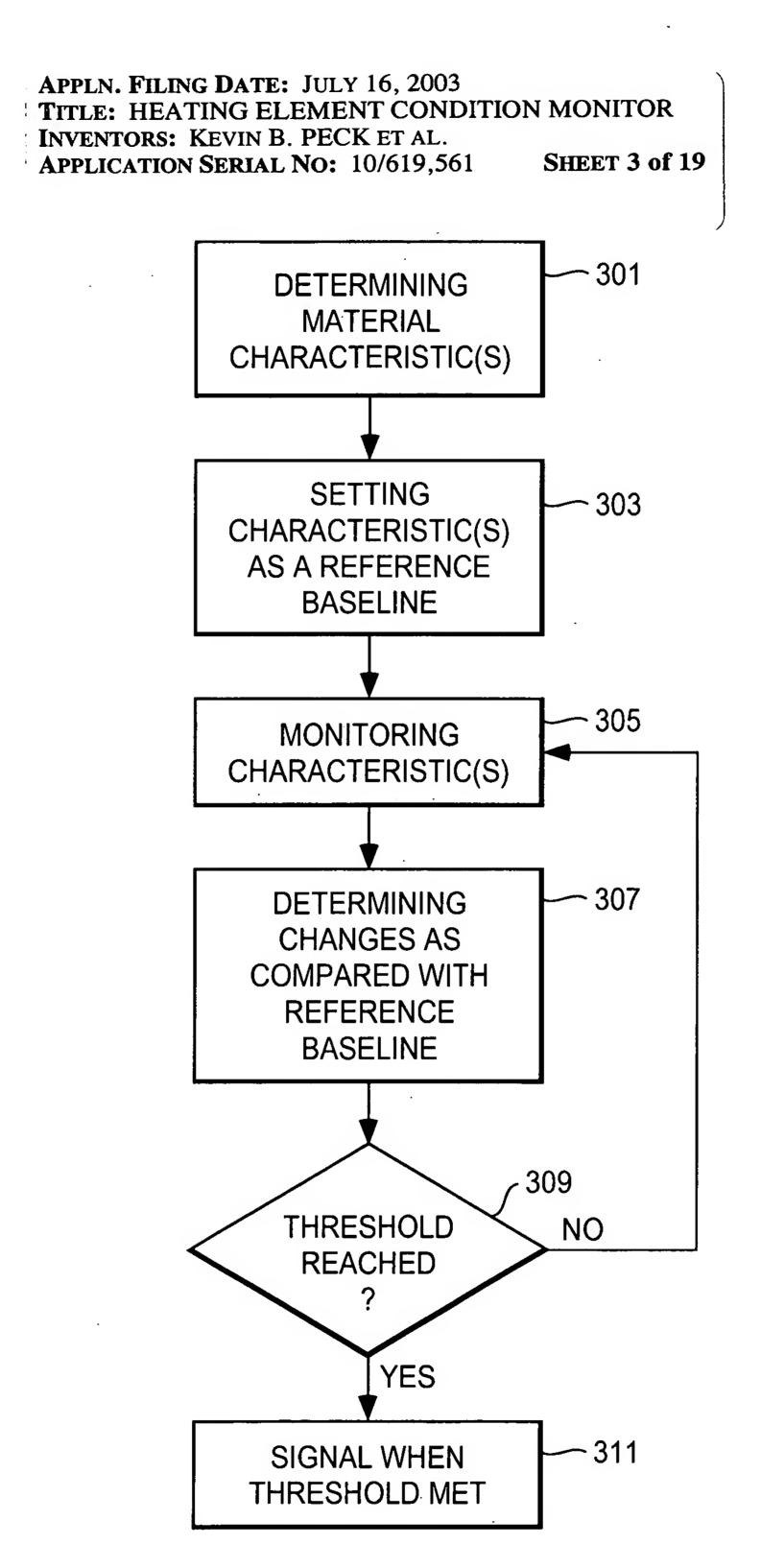
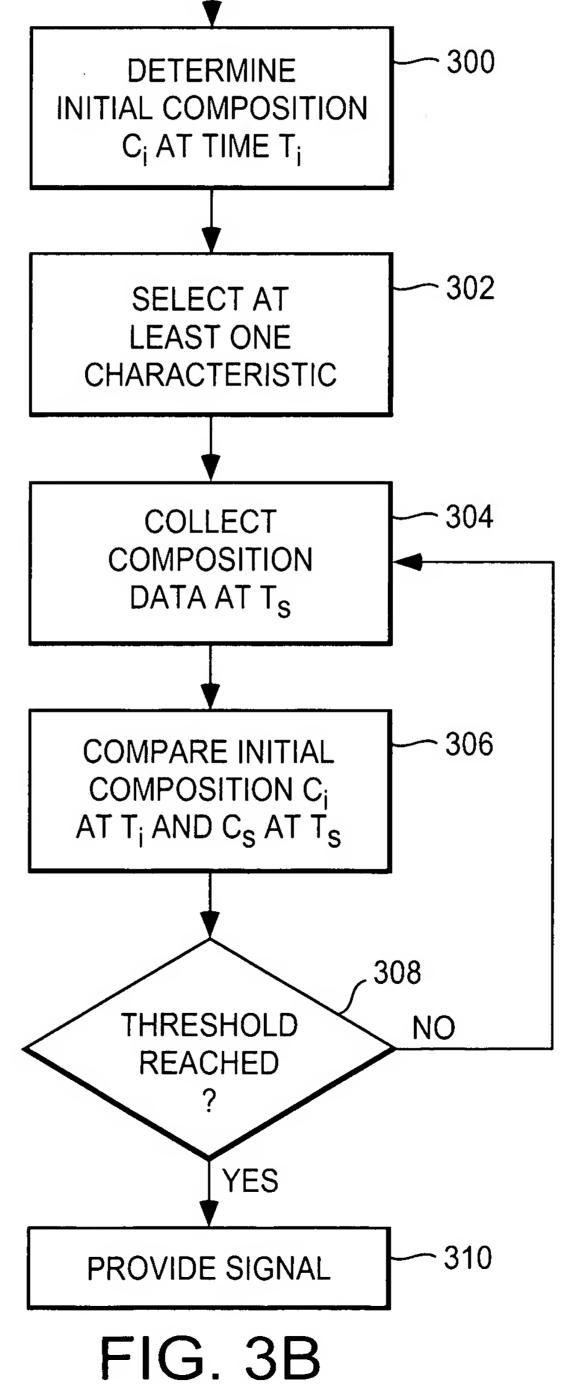


FIG. 3A

APPLN. FILING DATE: JULY 16, 2003 TITLE: HEATING ELEMENT CONDITION MONITOR INVENTORS: KEVIN B. PECK ET AL. SHEET 4 of 19 **APPLICATION SERIAL NO: 10/619,561** 298 **INSTALL HEATING ELEMENT** - 300 DETERMINE **INITIAL COMPOSITION** C_i AT TIME T_i 302 **SELECT AT** LEAST ONE CHARACTERISTIC 304 COLLECT COMPOSITION DATA AT T_S 306 COMPARE INITIAL COMPOSITION Ci



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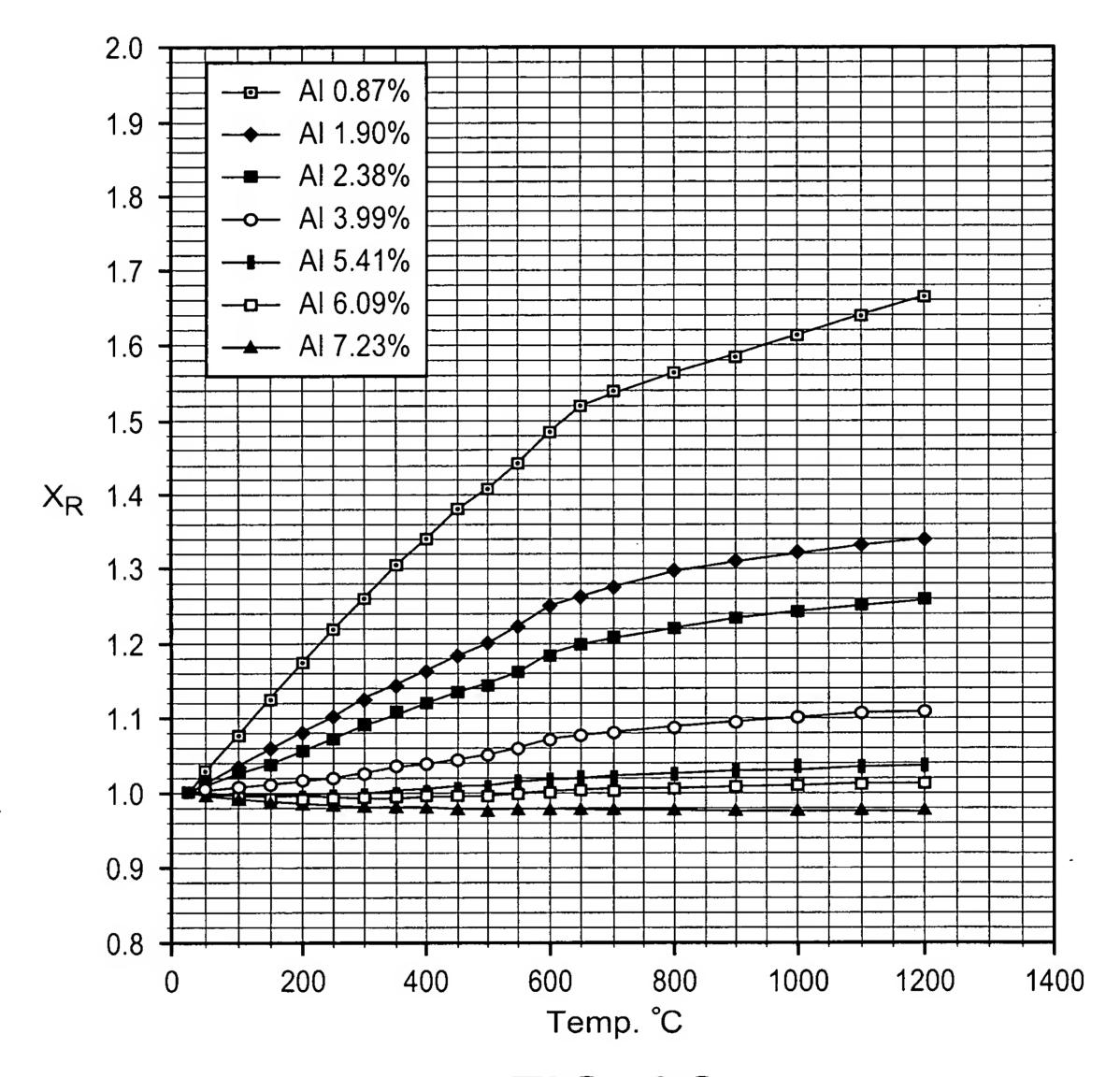


FIG. 3C

TITLE: HEATING ELEMENT CONDITION MONITOR

INVENTORS: KEVIN B. PECK ET AL.

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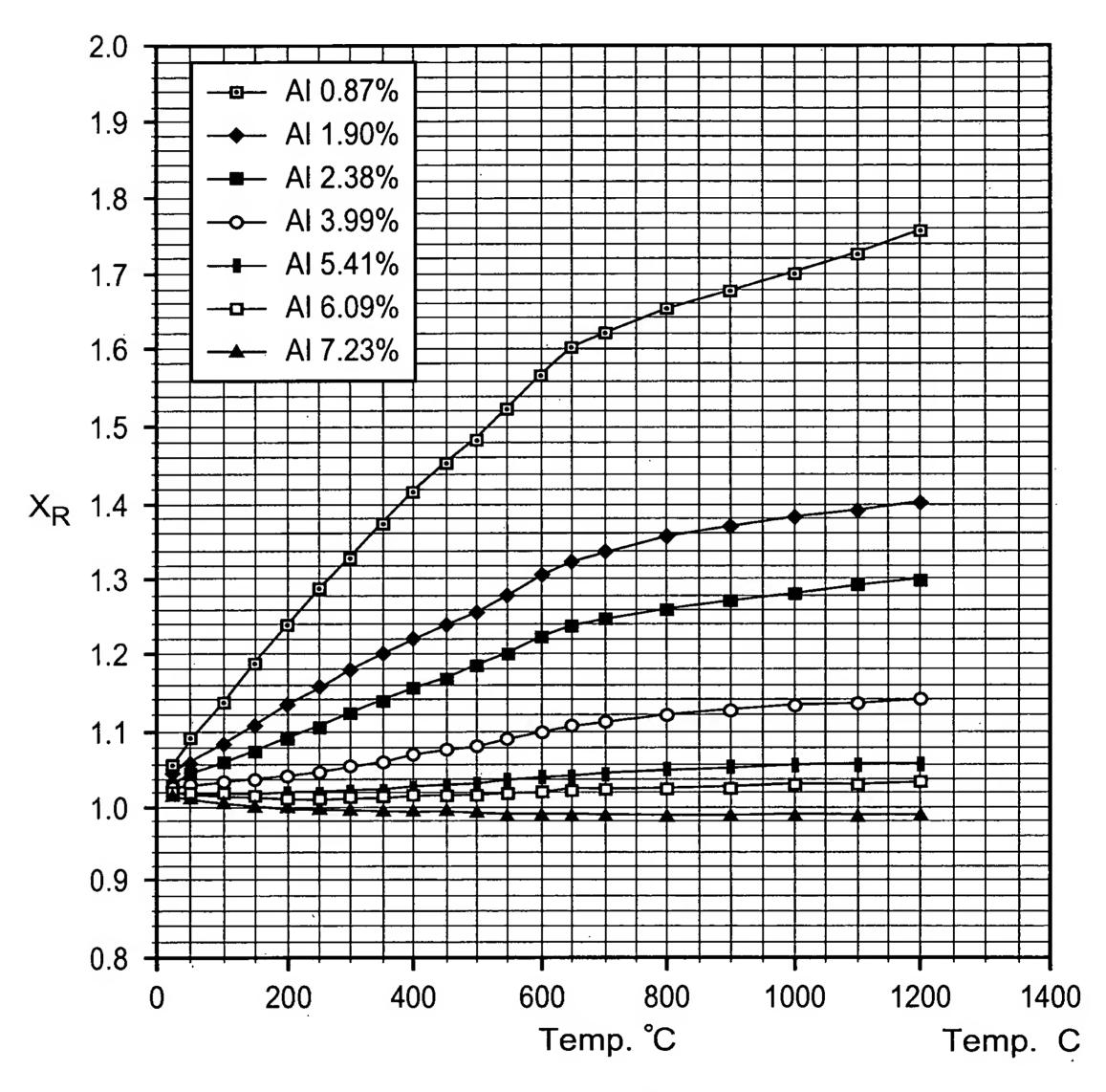
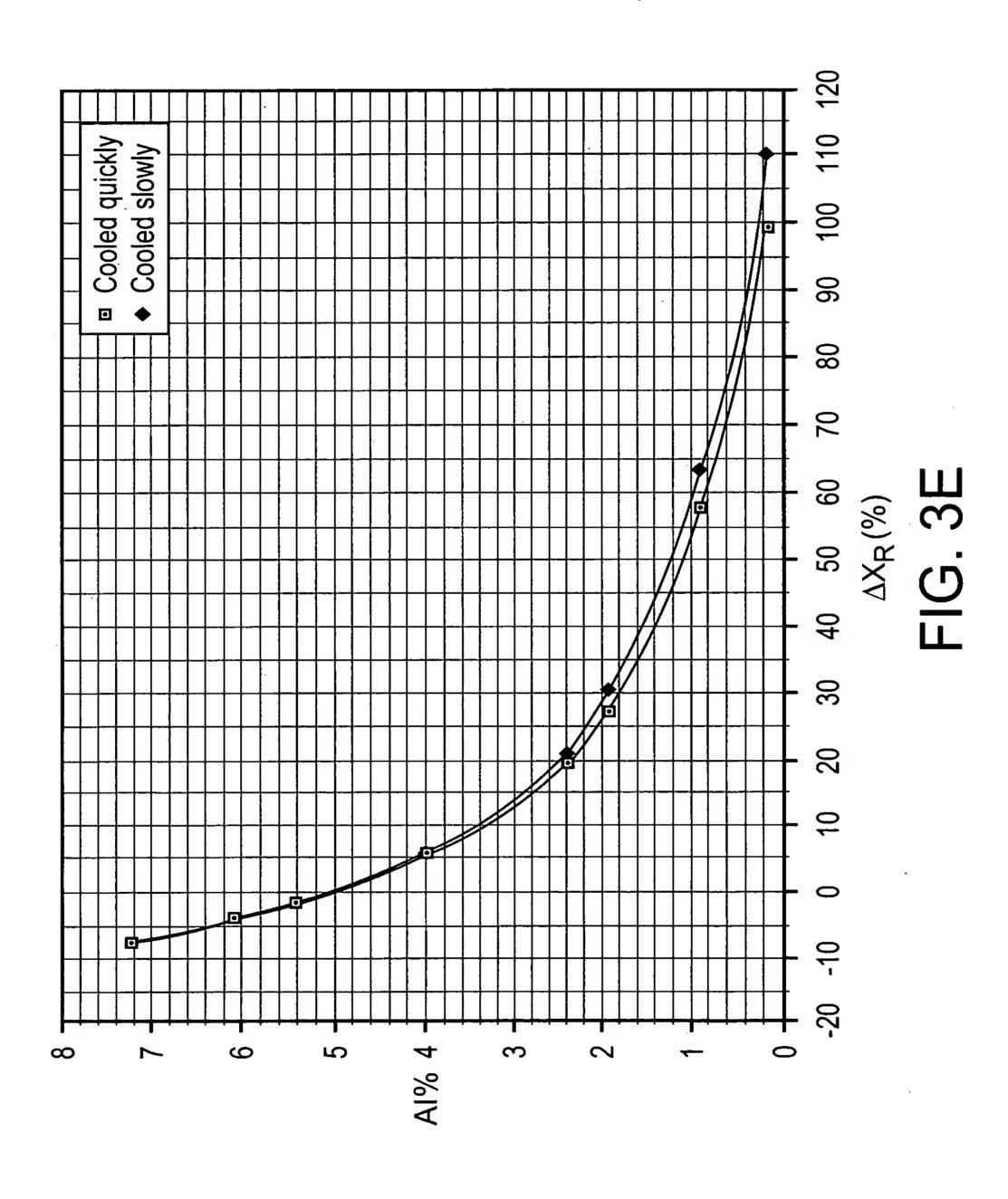


FIG. 3D

TITLE: HEATING ELEMENT CONDITION MONITOR

INVENTORS: KEVIN B. PECK ET AL.

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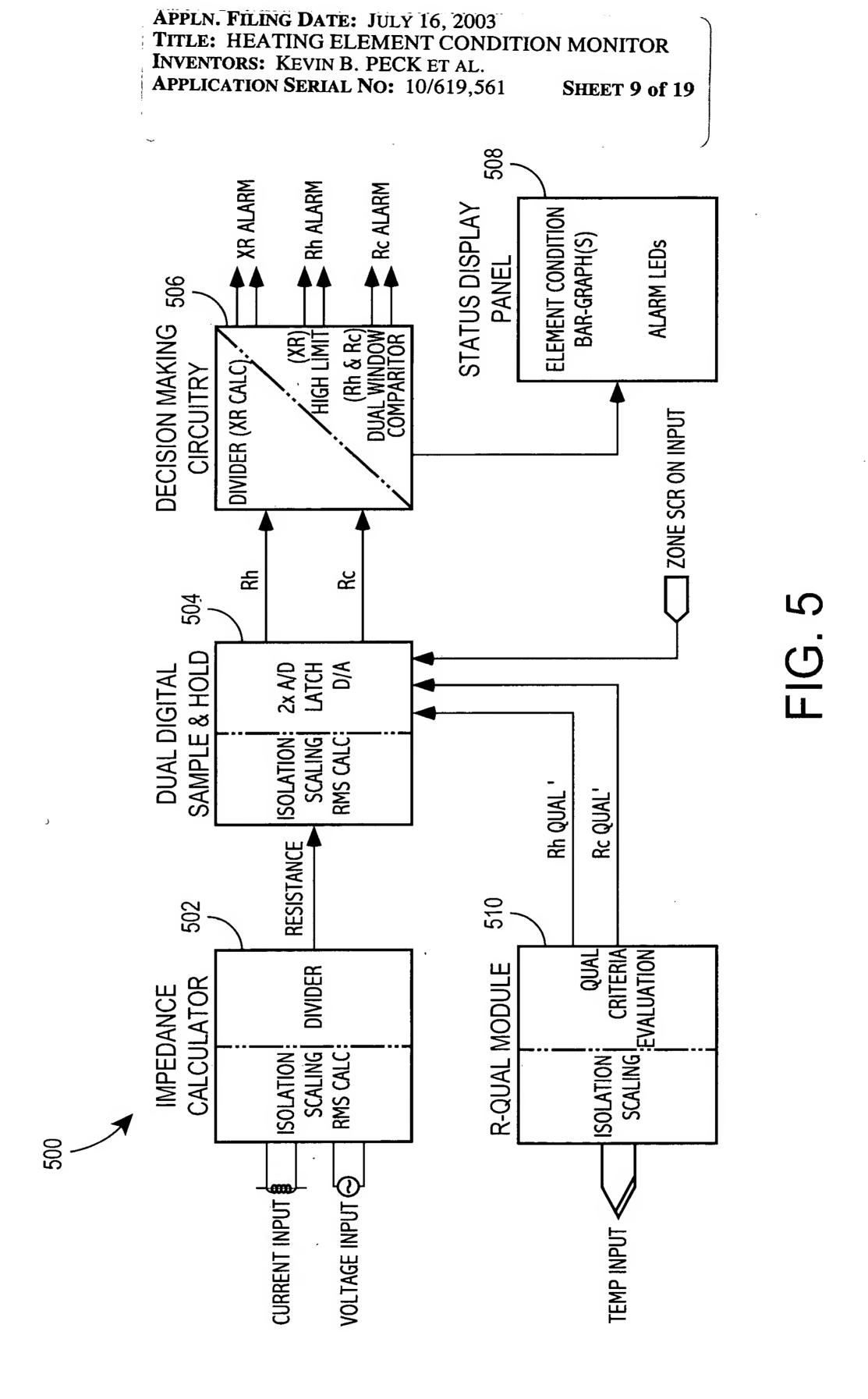


INVENTORS: KEVIN B. PECK ET AL.

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Time	Hot Resistance	Cold Resistance	Resistance Ratio	Remaining Alloy
T ₁	R _{h1}	R _{c1}	X _{R1}	A _{R1}
T ₂	R _{h2}	R _{c2}	X _{R2}	A _{R2}
Т3	R _{h3}	R _{c3}	X _{R3}	A _{R3}
•	•	•	•	•
•	•	•	•	•
•	•	•	•	•
T _n	R _{hn}	R _{cn}	X _{Rn}	A_{Rn}
400	402	404	406	408

FIG. 4



APPLN. FILING DATE: JULY 16, 2003 TITLE: HEATING ELEMENT CONDITION MONITOR INVENTORS: KEVIN B. PECK ET AL. APPLICATION SERIAL No: 10/619,561 **SHEET 10 of 19** 2 RESISTANCE XFMR
SECONDARY 130-911472 SIGNAL CONDITIONER W/130-911473 PCB ₹70BE 9 Y2 Z2 DIVIDER ≥6 ဖ 7 X2 2 CA 0.1 μF + CURRENT 0-1.5V=0-150A +15V 9 CURRENT FIG. **₹** CVB1 TRUE RMS TO DC CONVERTER UL FILE# E136219 C3: 0.47 use 1 L C8 L 1000pF ⊕15VDC \$ ZONE \$ELEMENT ∞ R12 1.8k R13 24K AD63710 ⊕15VDC 10 -15V 0.1 µF ∞ 9 2 LM555CN AD822(DUAL J-FET,1mV) 60 4 3 AD204JY 38 4 AD204KY 37 32 33

R6 13.3K

C5 0.1 μF

+150

0-1.5V=0-150V

502

CURRENT

25

+\S

VOLTAGE 0-1.5V=0-200V_Vi

+15V

ISOLATION AMPLIFIER

VIN VOLTAGE

R2 133K 1833K

14

0.1 µF=

+15V

TL084

-10Z1/X1

71

3

0-1.5V=0-200V

δ

15

VOLTAGE

9/-

R5 100K,1%

MPY634

APPLN. FILING DATE: JULY 16, 2003 TITLE: HEATING ELEMENT CONDITION MONITOR **INVENTORS:** KEVIN B. PECK ET AL. **APPLICATION SERIAL NO: 10/619,561 SHEET 11 of 19** REF02CP COSEL #ZTW32412 ALLIED #800-2780 IN +/-130MA MAX → +5V REF **OUT** +24V +15V →+15V **造** 10 μF ᆗ10 따 우35V +5V REF DC-DC ADC0804LCN **TANT ↓ 卆 10 μF** A/D CONV RTN -15V → -15V ALLIED# 288-0614 Vref/2 DB7 11 MSB 19 CLK R ₹3.9K 918-904599 330pF નcrk in ALLIED #711-1522 **LEAD SP 0.1' ANALOG INPUT** AGND 8 6 Vin+ $0.1 \, \mu F = \frac{1}{2}$ **DGND** 918-904556 Vin-CS **GND** 1KHZ $\overline{\text{RD}}$ → +5V REF 74C00 74HC14 74HC14 C23 = 0.01 μF SAMPLE CLOCK 0.1 µF → 74HC14 **ELEMENT ACTIVE** +5V√⊕ SCR ON +5Vref 74COO) R17 4.7K U10 LED, $R\bar{E}D\mbox{\cong}\mbox{$ AQV214E 74COO JP2 750 Ω R15 74HC14 ÷+5V√ ੴ Rh QUAL R18 4.7K +5Vref U11 AQV214E LED,RĒD $\S_{330}\,\Omega$ JP2 750 Ω R15 74HC14 +5Vref RI QUAL R19 U12 AQV214E LED, \overline{RED} \S_{330} Ω 4.7K

74HC14

FIG.7A

+24VDC 🕢

24V RTN 🗸

D1

VR

ELEMENT R (2

FROM FIG. 6

CLOCK

U11 7 TLC555CP 6

6.8K

SCR ON

Rh QUAL

RI QUAL

COM 🔘

COM 🔕

COM 🔯

24V [이-

24**V** 0

24V

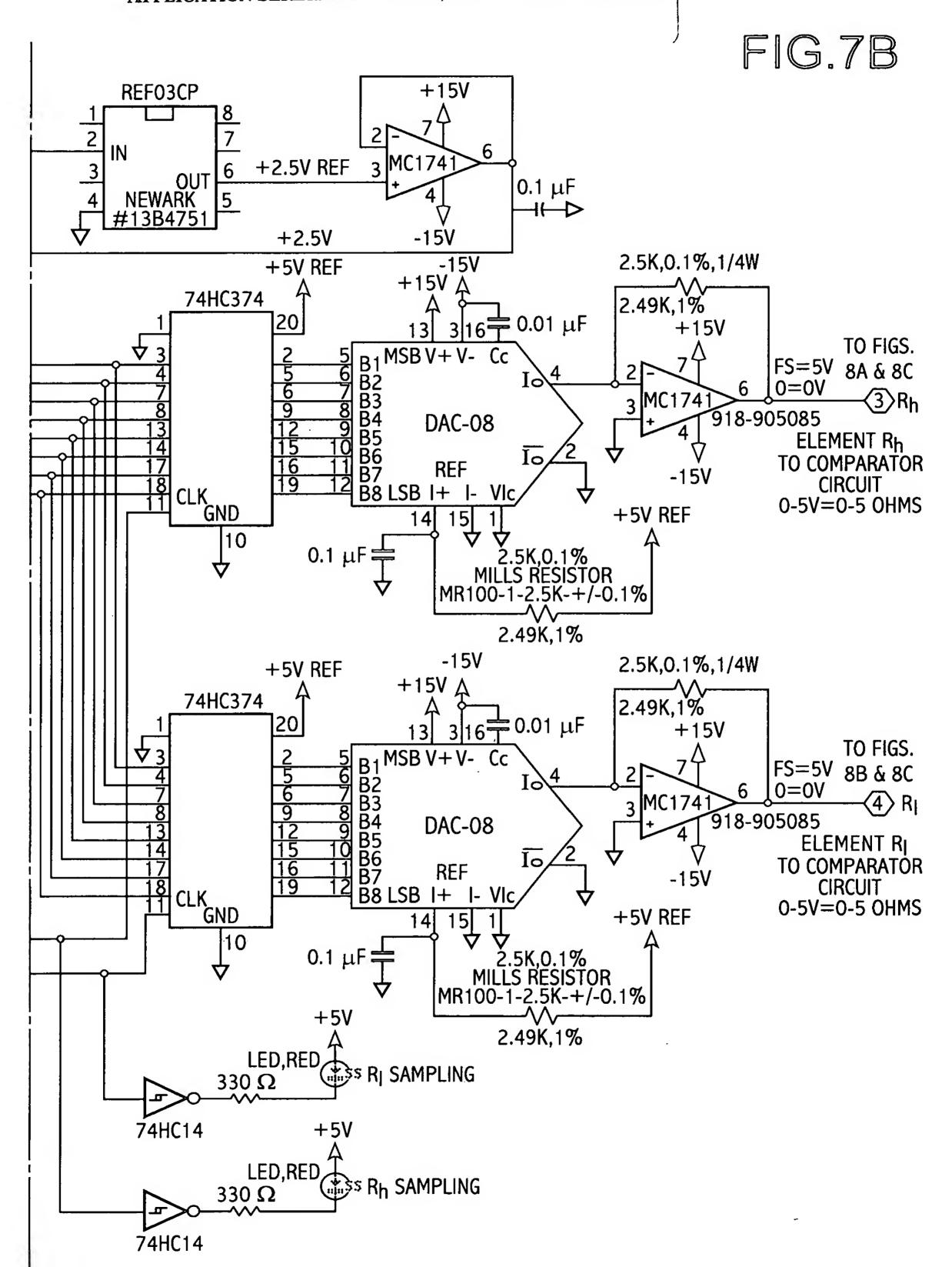
JP2 750 Ω R15

3

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INVENTORS: KEVIN B. PECK ET AL.

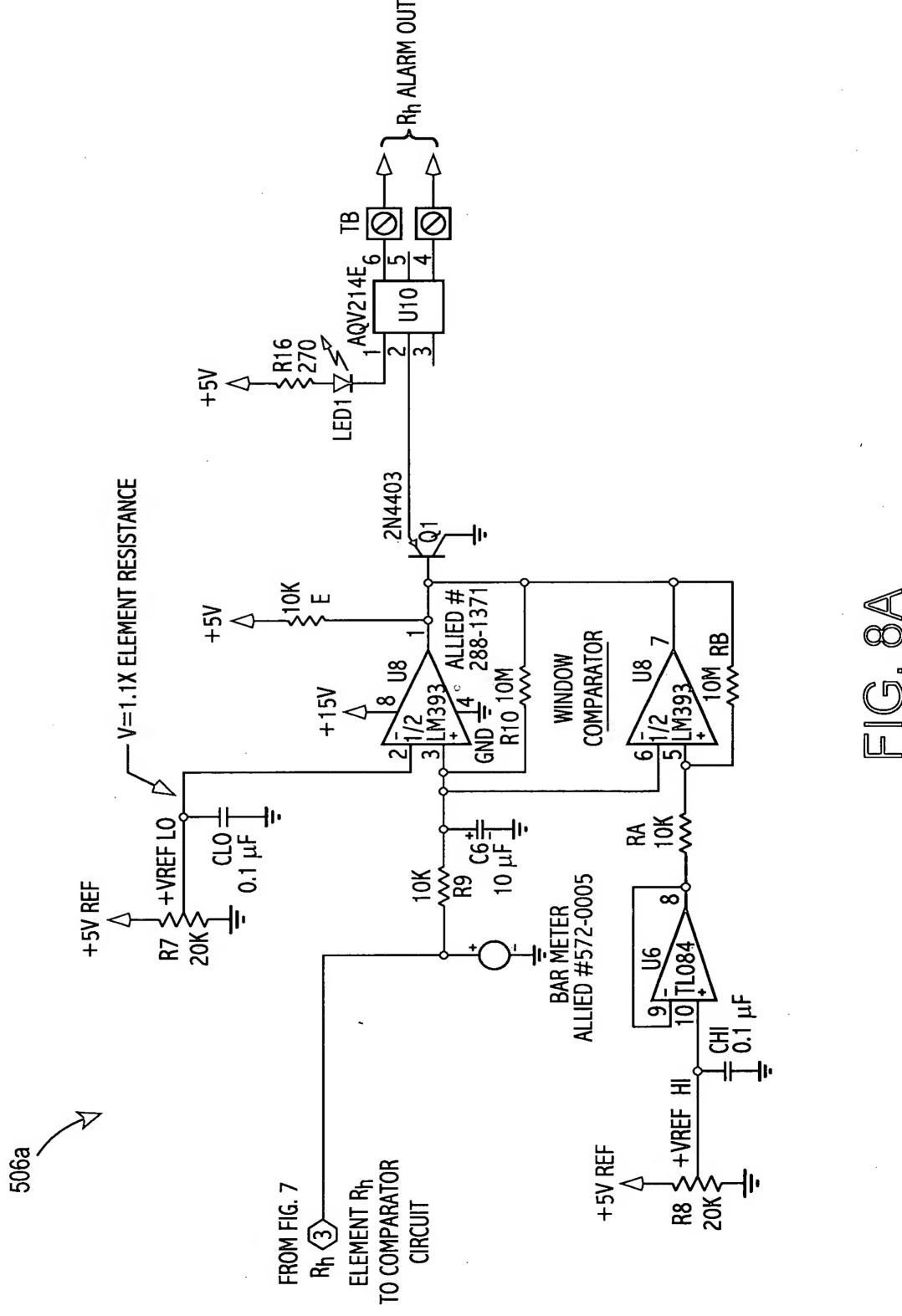
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INVENTORS: KEVIN B. PECK ET AL.

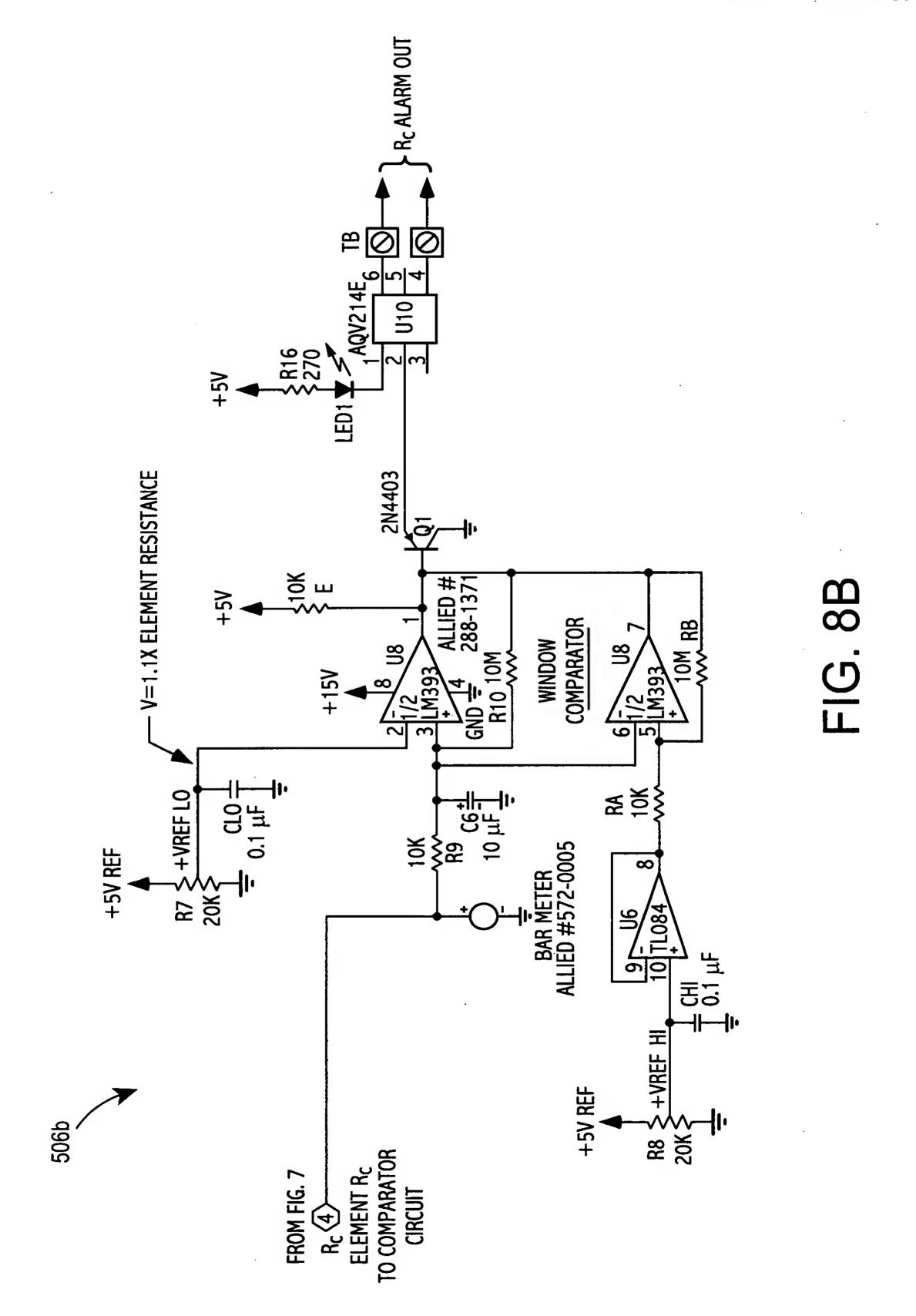
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TITLE: HEATING ELEMENT CONDITION MONITOR

INVENTORS: KEVIN B. PECK ET AL.

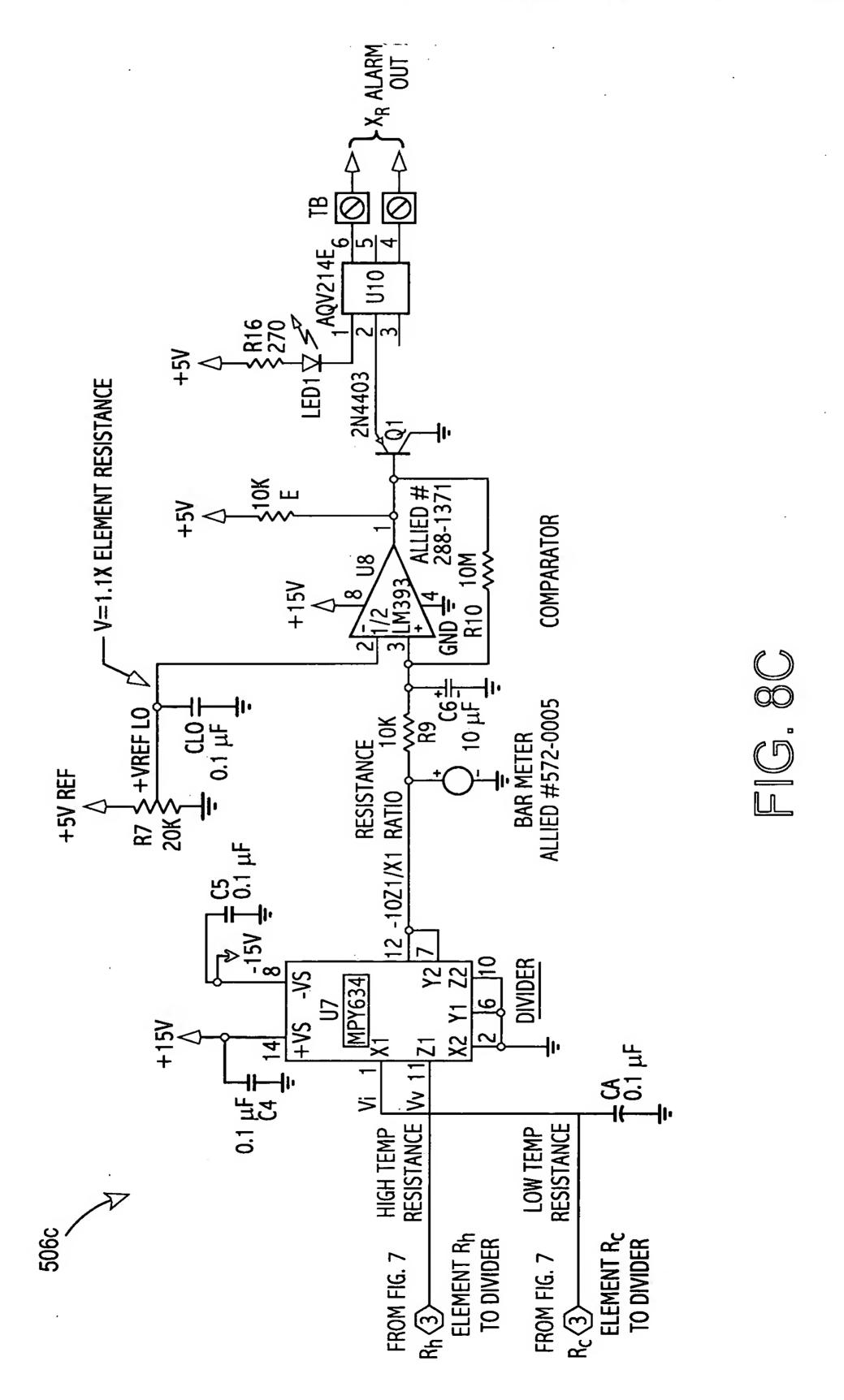
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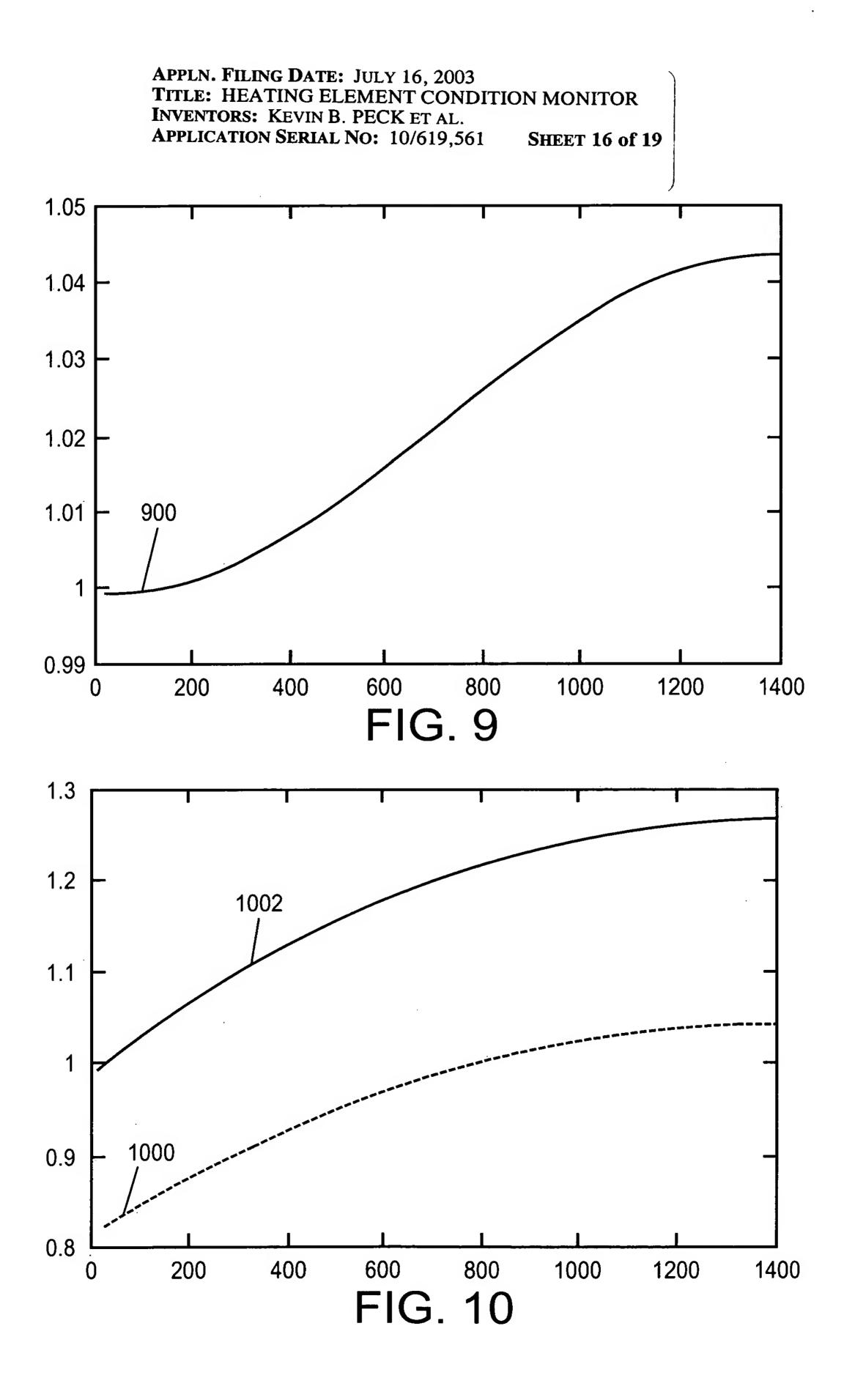


INVENTORS: KEVIN B. PECK ET AL.

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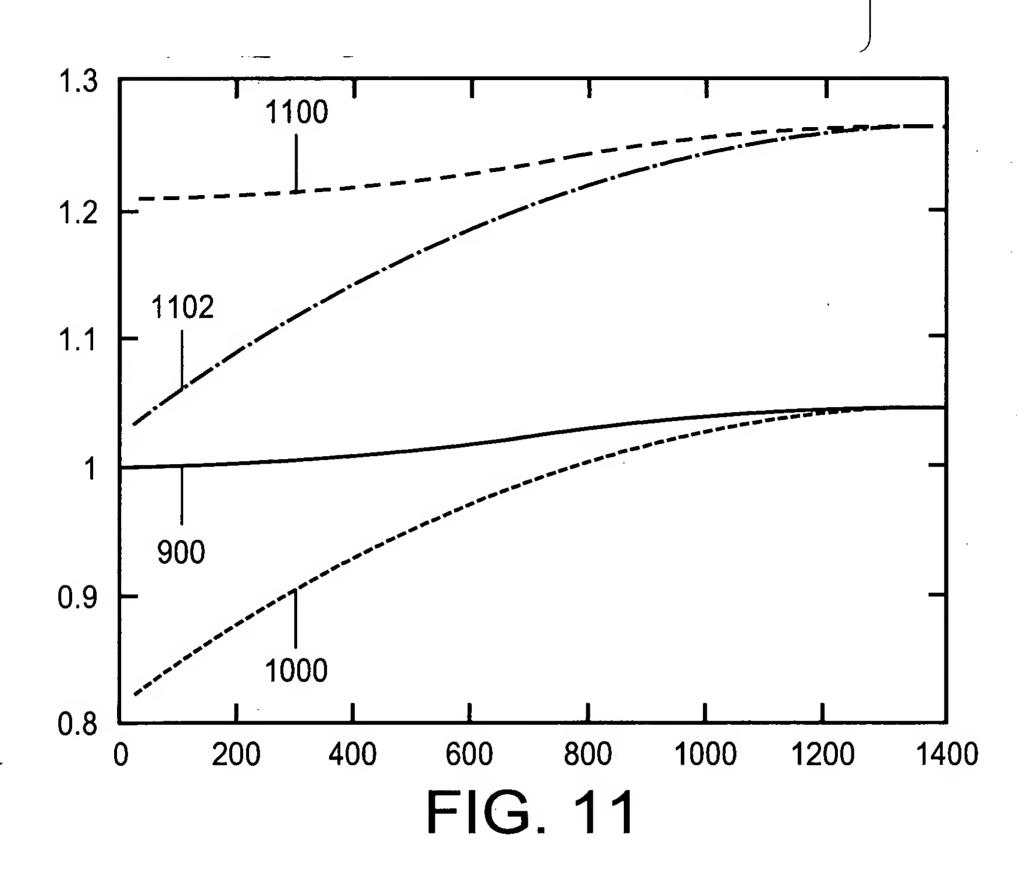


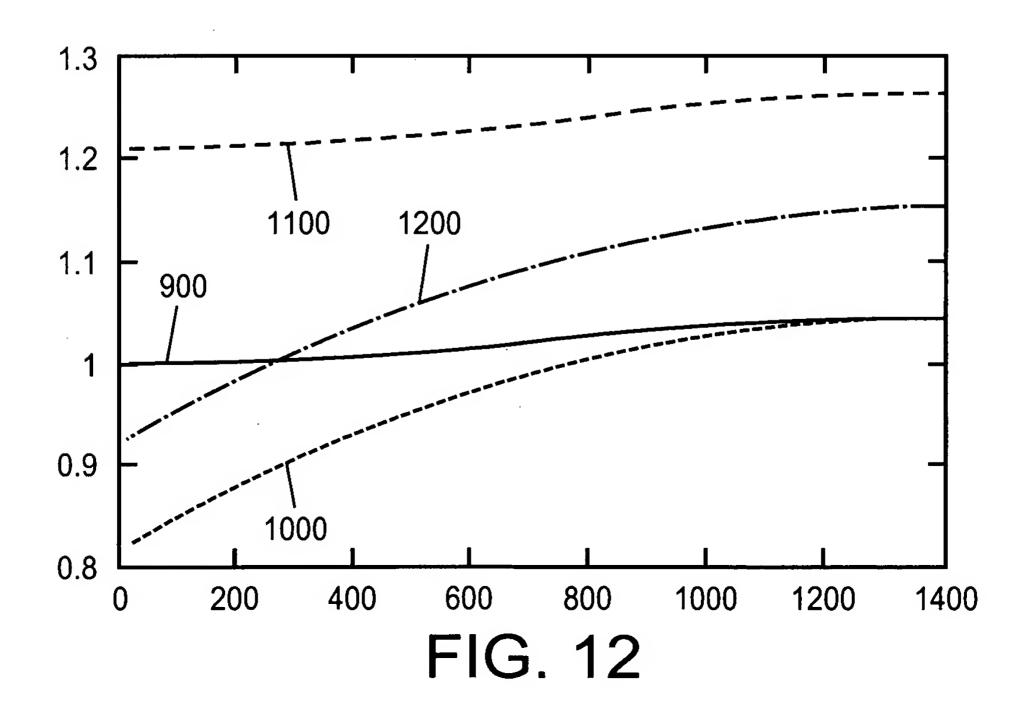


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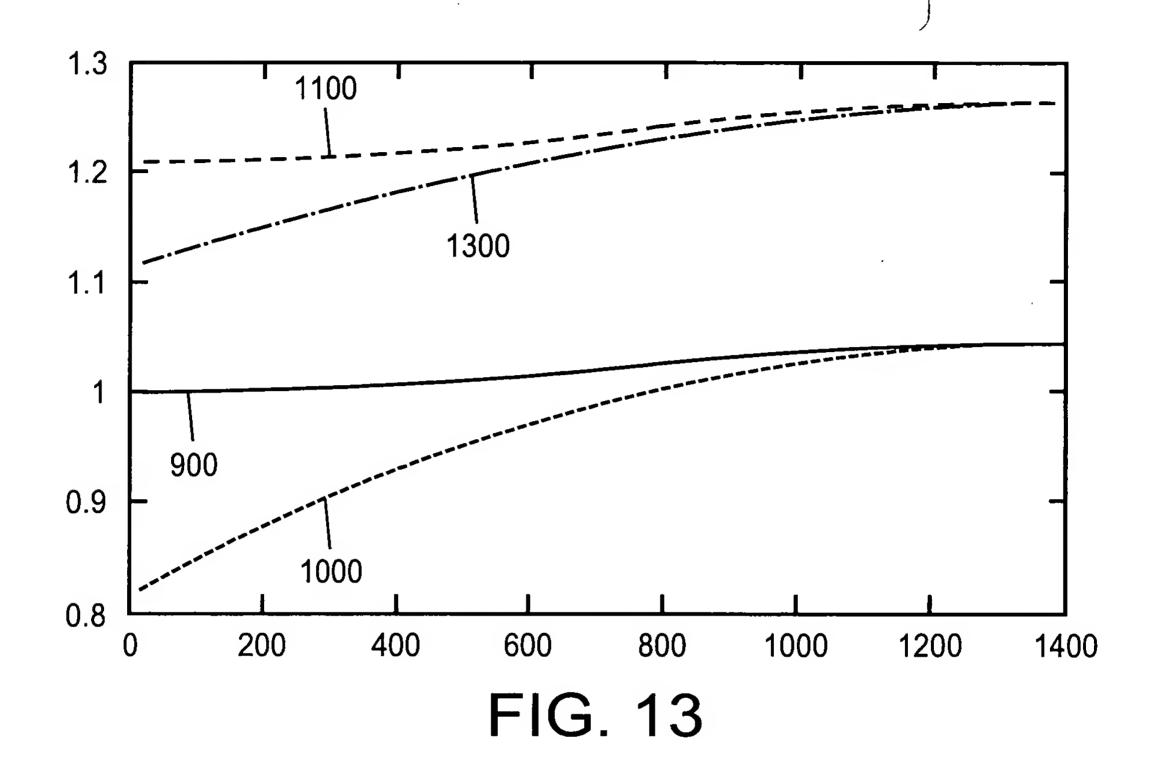




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INVENTORS: KEVIN B. PECK ET AL.

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